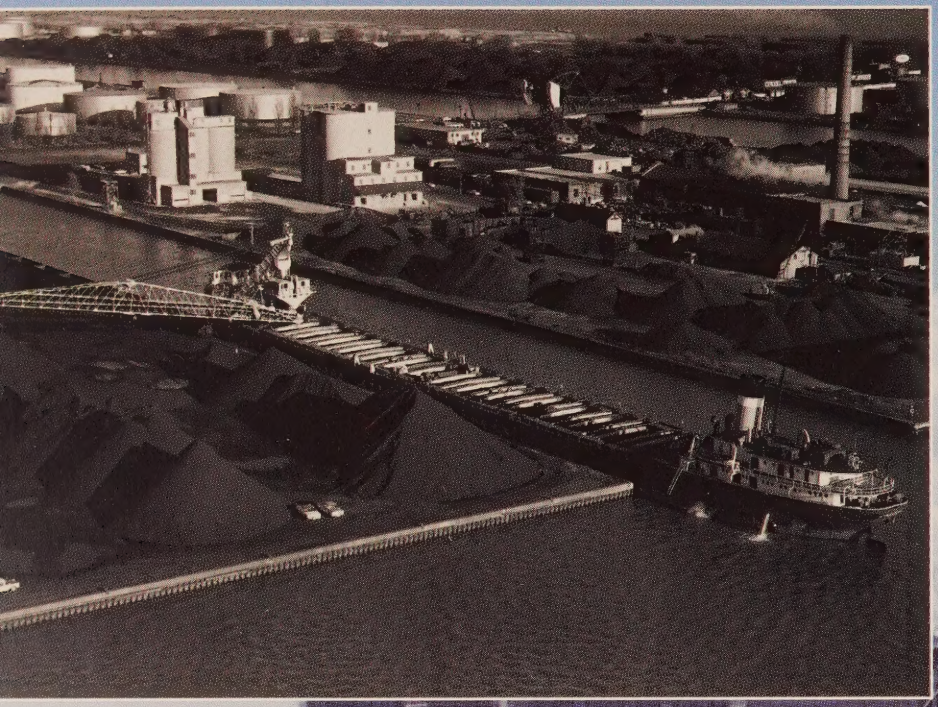
GREENING THE TORONTO PORT LANDS

Waterfront Regeneration Trust



GREENING THE TORONTO PORT LANDS

Michael Hough, Beth Benson
and Jeff Evenson

Waterfront Regeneration Trust

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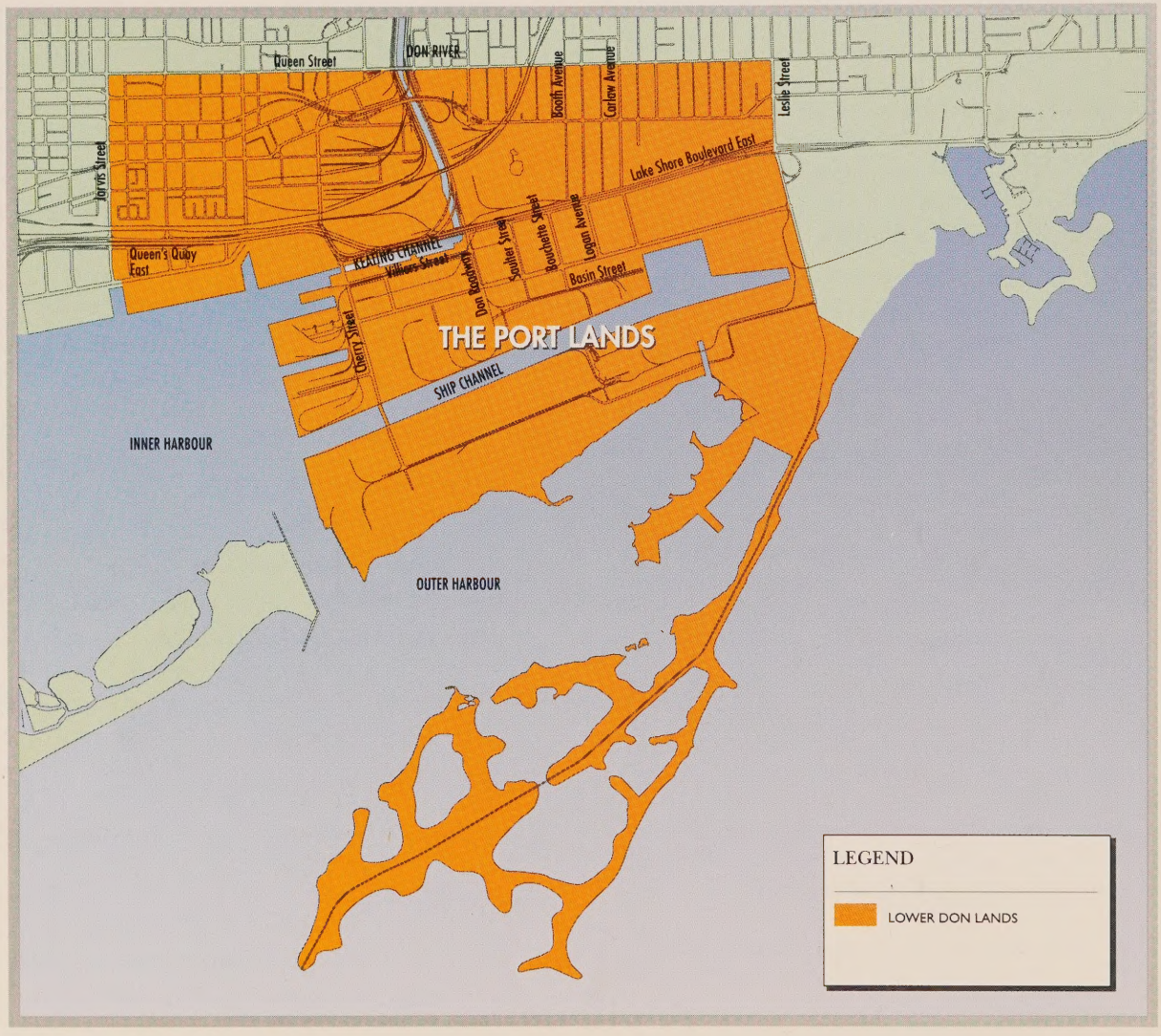
CONTEXT

The Port Lands, situated in the heart of Toronto's Lower Don Lands on Lake Ontario.



PREFACE

The Lower Don Lands have the potential to include both one of Toronto's prime industrial areas and a significant concentration of naturalized urban areas on the Lake Ontario waterfront.

The Port Lands are situated in the heart of the Lower Don Lands. The area is close to Toronto's downtown core and is well serviced by major highways, rail and marine modes of transportation. It is also connected by local roads and bicycle trails to long-standing residential communities to the north, west and east.

The open spaces of the Port Lands demonstrate some spectacular results of natural regeneration. Tommy Thompson Park (Leslie St. Spit) has become a world-renowned site for migratory birds, plants and other wildlife. Cherry Beach, part of the North Shore Parklands, is often one of the only swimmable beaches on Toronto's waterfront. These areas fulfill a growing need for people to connect with nature and to have access to the water's edge in the urban core.

In combination, these characteristics provide a unique set of competitive advantages for attracting investment that can provide secure jobs in the new industrial economy of North America.

Like many similar sites in other North American cities, industrial uses in the Port Lands have been in transition for a decade or more. The fuel storage tanks have been removed and the area dedicated to the outdoor storage of large quantities of coal, salt and aggregate has been substantially reduced. The decline of port-related industrial uses has occasioned a decade of vigorous debate among local politicians, environmentalists, and labour and community groups about the land uses appropriate for the Port Lands.

A consensus has emerged among local politicians, labour and adjacent communities that industrially zoned land in the Port Lands is essential to attract secure, well-paying jobs to the downtown waterfront. At the same time, local residents, birders, urban naturalists, and others are anxious to ensure that new uses do not impair the importance of the Port Lands' natural habitat. Use of the Martin Goodman Trail continues to increase as more and more people view this area as a place to enjoy water-related activities, cycling, and exploration of the natural features and cultural heritage of the place.

This report builds on a vision for the greening of the Port Lands first introduced in the publications of the Royal Commission on the Future of the Toronto Waterfront: *Watershed* (1990); *Pathways:*

Toward an Ecosystem Approach (1991); and *Regeneration: Toronto's Waterfront and the Sustainable City* (1992). Most recently in August 1997 the actions recommended in this report were supported in principle by Toronto City Council.

The green infrastructure for Toronto's Port Lands proposed in this report is a regional system that is the product of many hours of research, discussion, and the considerations of environmentalists of all kinds, urban designers, industrial and economic development experts, and local residents.

The framework presented in this report is consistent with the six principles that emerged from these deliberations which form the basis of a community consensus.
They are:

- provide a multi-functional framework for development in the Port Lands;
- protect and restore health and biodiversity;
- create linkages;
- recognize the watershed context;
- improve image and reinforce sense of place;
- involve the community.

These principles will be achieved by building on existing habitats and open spaces and restoring damaged ecosystems to develop a green infrastructure for the area.

A number of assumptions informed the development of these proposals for green infrastructure and will guide its implementation:

- the highest value must be placed on the health and safety of the people who work and recreate in the Port Lands, and the wildlife that lives there;
- the prime mover of both economic revitalization and environmental remediation will be private sector investment;
- the public sector has a key role as landowner and in the establishment of public policy to encourage implementation;
- the industrial character and the natural habitat character of the Port Lands are both important to attracting the kind of investment that produces secure, well-paying jobs reflective of Toronto's role in the global economy;
- regeneration in an urban context is a designed and managed process that balances the variables of economy, ecology and community; this in turn introduces the need for new ways of making decisions.

The green infrastructure is a specific framework for moving ahead with the work of greening the Port Lands. It is based on:

- a careful analysis of the functions that various kinds of green space can perform;
- the existing environmental conditions and what they will support;
- community objectives;
- feasibility of implementation in terms of cost, land ownership and development opportunities.

Many different habitats can be established within the hierarchy of green space proposed by the green infrastructure system. Depending on scale, use and environmental conditions, they can include wetlands, ponds, forests, hedgerows, meadows and treed boulevards. The system can encompass any number of proposals to improve the health of the Don watershed and waterfront

lands, create corridors for wildlife movement, improve streetscapes and create better measures for stormwater management.

Greening the Toronto Port Lands makes explicit the urban ecological functions that can be performed by the various elements of green infrastructure and provides decision makers with an understanding of the integration of ecological and economic considerations. By establishing this approach to greening the Port Lands now, we can ensure that new development includes the appropriate elements of green infrastructure and that each new development makes a significant contribution to improving the environmental quality of the area.

At a regional scale, Metropolitan Toronto's Official Plan is supportive of green infrastructure, particularly through its promotion of the Metropolitan Green Space System. In particular, the green space linkages and connected habitats proposed by this report are consistent with the principles in Metro's Waterfront Plan.

The existing policies in the City of Toronto's Official Plan are also generally supportive of the objectives of the green infrastructure as outlined in this report. The existing Zoning By-law would allow all of the recommendations in the report to be implemented. As more detailed plans are developed regarding streetscape and the integration of green infrastructure into development blocks, it is expected that planning staff will review the By-law to determine whether it is necessary to add specific provisions related to setbacks or other zoning matters to reinforce the recommendations presented here. Through site plan approval, it will also be possible for planning staff working with private sector proponents and/or the Toronto Economic Development Corporation (TEDCO) to implement elements of the green infrastructure as development applications are received. If there is any need to recognize the objectives of the system in terms of a policy statement or revisions to the maps attached to the Official Plan, this can be dealt with as part of the next review of municipal official plan policies.

We believe that this plan to green the Port Lands provides a framework for assessment of ecological functions and decision making in the public and private realms of the Port Lands, and works equally well at an area-wide and site-specific scale. The greening of the Port Lands cannot be something that investors are made to do; rather, it must be something that makes sense to do because it improves the quality of life and may cost less. We believe that this system will meet the test on both counts.

We hope that agencies, landowners, tenants and other interested individuals associated with the Port Lands will find this report helpful and timely. We welcome your suggestions and comments.

Jeff Evenson Beth Benson

Waterfront Regeneration Trust
1997

1.0 INTRODUCTION

A STRATEGY FOR ENHANCING THE VISUAL, HERITAGE AND ENVIRONMENTAL QUALITY OF THE PORT LANDS

Most people would agree that the Port Lands are badly in need of a face lift. Much of the place is visually unattractive; many of the older buildings are run down. Litter, scrap metal operations, outdoor storage areas, chain link fences, hoarding, and untidy road verges, all give an impression of a derelict and uncared-for part of the city. There are also hazardous materials, noise, odors, and dust from trucks and existing industrial operations, that can result in impacts on health and safety.

However, there is another side to the Port Lands. Throughout the area, naturalizing vegetation on vacant lands and backfields provides a diverse, seasonally changing, colourful, and natural landscape for the pedestrians and cyclists who travel through it, and for families who come to pick dandelion leaves and local herbs for the kitchen. The area has produced a surprisingly diverse natural environment. Approximately 300 species of plants and over 260 species of birds have been identified in the Port Lands.[1]

The place is alive with people and activity, particularly during the summer months. In response, food concessions have sprung up along the public routes to cater to this growing public. In 1995, surveys by the Metropolitan Toronto and Region Conservation Authority (MTRCA) showed that over 58,000 people travelled through the Port Lands to visit Tommy Thompson Park.[2] So, while the visual quality of the Port Lands urgently needs attention from an urban design and aesthetic perspective, there is great potential for revitalization by building on what is already there. *Greening the Toronto Port Lands* is a strategy for revitalizing and enhancing the visual, heritage and environmental quality of the area.

2.0 GREEN INFRASTRUCTURE

The first step in the revitalization process is to establish a long-range strategy to develop a network of parks and corridors – green infrastructure – that will provide an attractive and functionally useful setting for future development in the Port Lands. Toronto's uniqueness as a place is in no small measure due to its extensive natural features – its deep, densely wooded ravines, the Don and Humber rivers, the Lake Iroquois Escarpment and Lake Ontario. Thanks to the City's past foresight in protecting them, these features are well recognized for their significance to the environmental and economic well-being of Toronto. This is clearly evident in the many prestige developments that border both the Escarpment and the ravine system.

2.1 Precedents

There are important economic, environmental, social, and recreational advantages in establishing green infrastructure. Within the Great Lakes Basin, the States of Illinois and Wisconsin undertook an inventory and analysis of their physical and cultural landscape resources at the beginning of the 1960's. The goal of this plan was to map the States' water, vegetation, wetlands, significant topography, and archaeological and historic sites, with a view to identifying development options that would "minimize human impact on the land and preserve its life support systems, quality of life, sense of place, diversity, and options of choice".[3] The resource patterns that resulted from this mapping overlapped to form linear 'environmental corridors' that contained the vast majority of the States' natural diversity. They became the main determinant that defined the areas where natural features should be protected, and where future urban growth should be located.

A recent study of Hennepin County by the City of Minneapolis, through the Parks and Public Works Commission, found overwhelming historical evidence that well designed and carefully integrated parks and public works projects maintain and enhance the long-term tax base of neighbourhoods while improving their quality of life.[4] For instance, homestead properties experienced an increase in market value of 30 percent between 1987 and 1992. This basic finding led the Commission to the conclusion that locating projects (coordinated parks, public works and infrastructure improvements) in urban neighbourhoods and suburban communities which do not have such amenities, or which are experiencing a decline in property values, or both, is a way of protecting the tax base as well as creating amenities which encourage long-term investment. An important corollary is that the implementation of these projects will provide immediate employment and job training while laying the groundwork for long-term employment opportunities.[5]

Another example of relevance to the Port Lands can be found in the Ruhr Valley in northern Germany where the need for economic renewal of old industrial areas has become most obvious in communities where once prosperous industries of the past such as coal and steel have become obsolete. They have left behind large tracts of derelict land, polluted and channelized rivers, along with massive unemployment and a depressed economy. In the Emscher region of the Ruhr, an area of some 800 square kilometres and a population of two million, major restructuring has begun with ecological renewal. This involves the creation of a network of parks, the renaturalization of channelized rivers, the restoration of biodiversity and the improvement of water

quality.[6] The decommissioned steel works at Meiderich are also being preserved for public use as a monument to the heavy industry of the past, together with the emerging forest that has grown up between the various structures. The green space is reported to support a number of endangered plants and animals.[7]

2.2 Principles

Based on the overall philosophy that development in the Port Lands should result in an attractive and safe place for people and wildlife, the following six principles should guide the detailed design and implementation of the green infrastructure:

a. Provide a multi-functional framework for development in the Port Lands

The green infrastructure should have economic, environmental, biological, recreational, and visual value for those who work and recreate in the Port Lands, and for those who live nearby. Its planning function is to establish a network of parks and corridors that will provide an attractive and functionally useful setting for future development and public use in the Port Lands.

b. Protect and restore health and biodiversity

The ecological and human health of the Port Lands – its land, air, and water – must be reestablished in the context of the natural systems and human history that have shaped the area.

c. Create linkages

Biological and recreational connections between the Lower Don River and the Lakefront should be established.

d. Recognize the watershed context

The hydrological, water quality, habitat and public access relationships among the Port Lands, the Don River and the watershed should be included when making decisions about the green infrastructure.

e. Improve image and reinforce sense of place

The redevelopment process should take advantage of, and build upon, the special industrial, cultural and ecological history of this waterfront location. An urban design character that is separate and distinct from other districts in the city should be encouraged.

f. Involve the community

No regenerative process can be successful without the participation of stakeholders in the decision-making process. They include government agencies, interested citizen organizations, existing businesses, potential development interests and the general public.

2.3 Functions

The following four basic functions provide the basis for realizing these principles:

a. Improve Environmental Quality

- ambient air quality improvement
- noise abatement
- microclimate enhancement
- stormwater management
- soil and ground water management

b. Restore Natural Habitats

- create wildlife habitat (for seasonal/year-round resident wildlife)
- support wildlife movement

c. Enhance Recreational Opportunities

- expand and maintain trail systems
- interpretation of natural and cultural features

d. Enhance Urban Design

- improve aesthetic quality
- preserve and enhance sense of place
- improve public access

EXISTING GREEN INFRASTRUCTURE

There are significant environmental assets in the Lower Don Lands; however, existing green space is poorly connected and access is limited.

PROPOSED GREEN INFRASTRUCTURE

The proposed green infrastructure system will improve environmental quality, provide economic benefits, and will establish essential linkages in the area for wildlife and humans.

2.4 Hierarchy of Green Space

Green infrastructure can provide a variety of functions, and its spatial and design requirements will vary accordingly. The proposed hierarchy is intended to suggest realistic long-term goals and objectives for the enhancement of the Port Lands, and has the flexibility to be modified in the short-term to meet existing conditions and priorities.

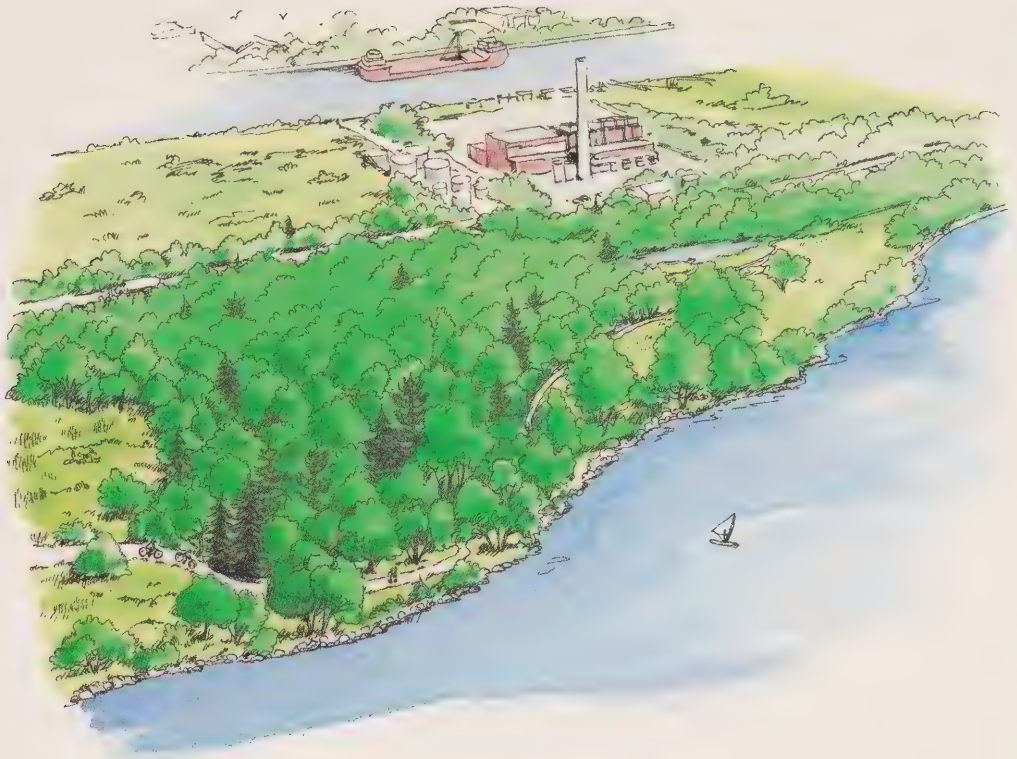
The following description sets out the overall long-term vision for green infrastructure in the Port Lands. Subsequent sections in this report examine its various functions and characteristics in more detail, and suggest the various options, given short-term planning and development realities and the need for flexibility in the implementation approach.

The proposed hierarchy has six main components:

a. ***Four major parks*** linked to the corridor system function for wildlife habitat, passive and water-related recreation, and environmental education:

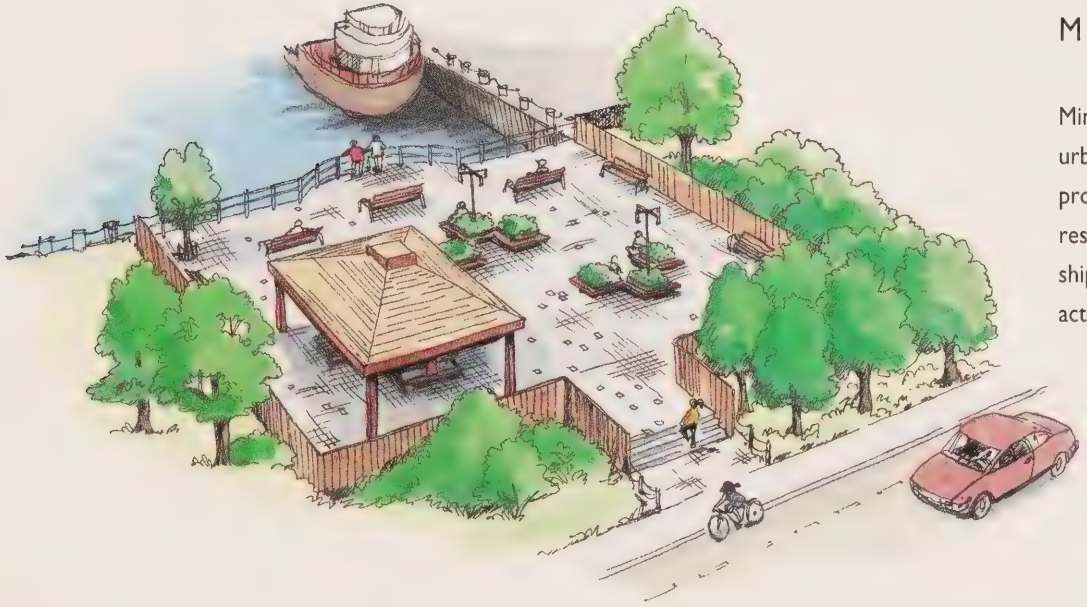
- the 480 Lands, which are located between the Keating Channel and the railway berm (in 1993 this land was designated in the City's Part I Official Plan as Open Space, but is not yet developed as a park);
- the North Shore Parklands;
- Tommy Thompson Park and the Baselands;
- Ashbridge's Bay Park.

b. ***Minor parks*** provide places for resting and viewing shipping and other activity. Examples include the Jarvis St. Slip and the Polson St. Slip, as well as streets such as Carlaw Ave. and Cherry St. at the Ship Channel. Minor parks also include McCleary Park, south of Lake Shore Blvd. between Bouchette St. and Logan Ave.



MAJOR PARK

Major parks are linked to the corridor system. They provide wildlife habitat and carry out many other ecological functions.



MINOR PARK

Minor parks are more urban in nature and provide places for resting, and viewing shipping and other local activities.

c. ***Wide corridors*** along major streets enhance stormwater drainage, storage and treatment; allow air quality improvement; and provide travelways for wildlife.

North/south corridors include:

- Cherry St. from Villiers St. to Unwin Ave.;
- the Don Roadway south to the North Shore Parklands;
- Leslie St. from Lake Shore Blvd. to Tommy Thompson Park.

East/west corridors include:

- Lake Shore Blvd. from Don Roadway to Ashbridge's Bay Park;
- Commissioners St. between Cherry St. and Leslie St.;
- a shoreline corridor extending from Leslie St. to Ashbridge's Bay Park.

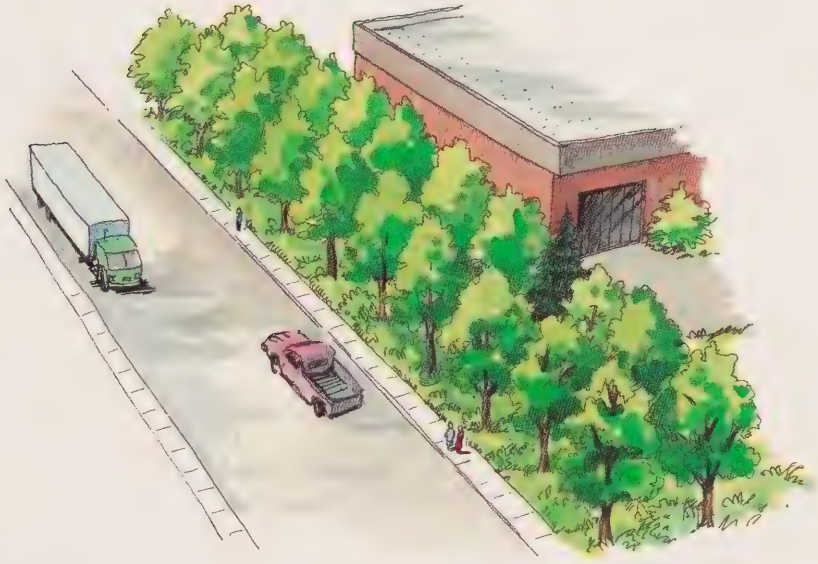
d. ***Narrow corridors*** on other north/south and east/west streets in the Port Lands (including Villiers St., Basin St., Logan Ave., Bouchette St., Saulter St., and Carlaw Ave.) that function to enhance microclimate and aesthetic quality, and to provide cycle and pedestrian ways.

e. ***Water's edge promenades*** along waterfront piers bordering the inner harbour provide public access to the waterfront. Promenades are envisaged as extensions of the Harbourfront and East Bayfront promenades that are in the City of Toronto's Official Plan and also in Metro's Waterfront Plan. Negotiations for implementation of the East Bayfront promenades are currently in progress. City policy is to pursue public access wherever it does not conflict with existing industrial operations.[8]

f. ***Development parcels.*** Landscaping and design of open spaces within development parcels should contribute to the green infrastructure system. The functions provided by adjacent wide and narrow corridors can be further enhanced by complementary landscape design within development parcels.

WIDE CORRIDOR

Wide corridors enhance stormwater management, improve air quality, provide habitat and travelways for wildlife and allow for recreational opportunities.



NARROW CORRIDOR

Narrow corridors enhance microclimate and aesthetic quality, and provide cycle and pedestrian ways.

Figure 1.
Green Infrastructure Functions

	Ambient air quality improve-ment	Noise abatement	Microclimate enhance-ment	Storm-water management	Soil and ground water management	Wildlife movement	Wildlife habitat	Sense of place	Pedestrian/ cycle trail	Recreational oppor-tunities
Wide corridors	●	◖	●	●	●	●	●	●	●	●
Narrow corridors	◖	◖	●	◖	◖	◖	◖	●	●	●
Major parks	●	●	●	●	●	●	●	●	●	●
Minor parks	○	○	○	○	○	○	○	●	●	●
Water's edge promenades	○	○	○	○	○	○	○	●	●	●
Development parcel landscapes	◖	○	◖	●	●	◖	◖	◖	○	○

LEGEND

● Function can be performed

◖ Function is constrained

○ Function cannot be performed

3.0 GREEN INFRASTRUCTURE

FUNCTIONS AND PERFORMANCE CRITERIA

Green infrastructure performs a variety of ecological, recreational and aesthetic functions. Dimension and design characteristics ultimately determine the number and type of functions that can be achieved at a given location. As the matrix in Figure I shows, not every function of the green infrastructure can, or should, be achieved in all locations, or in the same way.

The matrix should therefore be regarded as a qualitative assessment of the ability of different elements of the green infrastructure to perform a range of functions.

As an integrated system, green infrastructure should aim to perform the following ecological, recreational and aesthetic functions: improve environmental quality, restore natural habitats, enhance recreational opportunities, and enhance urban design.

3.1 Improve Environmental Quality

a. Ambient air quality improvement

Functions. There is growing scientific evidence that vegetation is effective in reducing air pollution. It has long been known that plants filter dust in cities. Ongoing research in plant physiology suggests, however, that they do much more than act as dust filters. Vegetation can also absorb air contaminants and cool ambient temperatures by providing shade. Cooler temperatures can reduce the production of ground level ozone.

A three year study in Chicago (the Chicago Urban Forest Climate Project, 1995) set out to quantify the effects of urban vegetation on local air quality and to help city planning and management organizations increase the net environmental benefits derived from Chicago's urban forests. The results showed that in 1991 trees in the City of Chicago (which is 11 percent tree covered) removed an estimated 17 tons of carbon monoxide, 93 tons of sulfur dioxide, 98 tons of nitrogen dioxide, 210 tons of ozone, and 223 tons of fine particulate matter. The study also showed that these trees sequester approximately 155,000 tons of carbon per year. Other related Chicago studies have shown that urban vegetation can mitigate ozone pollution by lowering city temperatures and directly absorbing the gas.[9]

The economic value of pollution removal in 1991 was estimated at $1 million for trees in Chicago and $9.2 million for trees across the larger study area (which included Chicago, Cook County, and DuPage County).

It should also be noted that the City of Chicago's tree canopy coverage of 11 percent can be compared to that of the City of Toronto which averages 20 to 25 percent overall. In contrast, the coverage for Toronto's waterfront is only 3 percent[10] (see Table 1, page 18).

In addition, trees can absorb significant amounts of chemical pollutants. In New Haven, Connecticut, one researcher reported that a sugar maple 30 centimetres in diameter removed 60 milligrams of cadmium and 140 milligrams of lead from the atmosphere during one growing season.[11]

It is important to recognize that plant species vary in their tolerance to air pollution and their effectiveness in improving air quality. While plants cannot be regarded as a panacea for ameliorating air pollution problems, they can make substantial environmental and economic contributions to this end. Given the City of Toronto's clean air objectives these functions have considerable importance.[12]

Performance criteria. The effectiveness of trees in improving ambient air quality is dependent on the percentage of vegetation cover over a given area. Tree canopies that cover large areas (such as City of Toronto residential neighbourhoods) are particularly effective for several reasons.

Tree canopies provide large areas of shade and their cooling influence on paved surfaces can reduce ozone production. The larger the canopy area the greater the ability of the vegetation to filter dust, reduce temperatures, and reduce ozone production. Ideally, this vegetation canopy approach to air pollution mitigation should be applied to entire development parcels. However, given the industrial functions of the Port Lands, which may result in large paved parking and storage surfaces and rooftops, the potential for maximizing overall vegetation within a development parcel presents a particular challenge.

Table 1 below, derived from a draft study by the City of Toronto's Parks and Recreation Division, indicates the importance of establishing tree canopies in the Port Lands and the need to encourage landowners and tenants to plant trees on their development parcels.

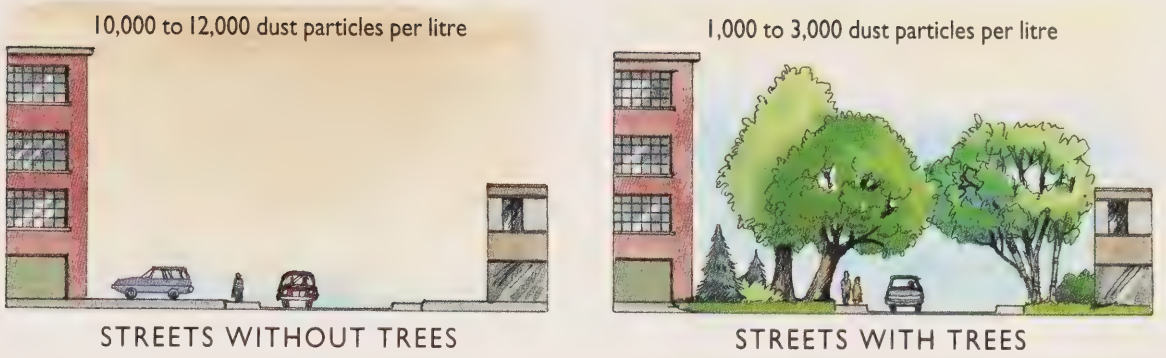
In addition to efforts within individual development parcels, extensive tree planting should occur in both wide and narrow corridors and on both sides of streets, to shade road surfaces and pedestrian/cycle ways. This arrangement will perform important air quality functions within street rights-of-way where much of the local air pollution is likely to be generated.

Since dense treed vegetation is more effective in pollution uptake than more open vegetation, and since large trees can remove 60 to 70 times more pollution than small trees,[13] the design of wide corridors should emphasize a natural and dense planting approach. A mixed deciduous and

Table 1. Average tree canopy coverage: City of Toronto

Land use category	Approx. % Land	Average % canopy coverage
Residential	45 % (4200 ha)	30 %
Commercial/Mixed Use	25 % (2400 ha)	8 %
Waterfront	15 % (1400 ha)	3 %
Natural areas	15 % (1400 ha)	40 – 60 %
City Total	100 % (9400 ha)	20 – 25 %

Source: Toronto (Ont.). Parks and Recreation Dept. 1993. Greening Strategies: draft report to the Declaration on the Environment Implementation Task Force.



Source: Adapted from Johnston, J., and J. Newton. 1996. Building green: a guide to using plants on roofs, walls and pavements. London: London Ecology Unit.

coniferous canopy of large trees should be included, particularly for air pollution mitigation in winter. The design of narrow corridors should also incorporate a deciduous and coniferous canopy, but these are conceived as more formal avenues, with two rows of street trees to maximize crown density.

The selection of species should be based on a balance of three factors:

1. pollution resistant vegetation;
2. the native species that occur naturally in the Port Lands and;
3. their installation and long-term management requirements.

Suggested species are provided in Table 2 (page 34). Understorey, shrub and ground layer planting should be included in the design of wide and narrow corridors to enhance wildlife habitat and to add aesthetic quality. A diversity of species is desirable to maximize benefits in terms of air pollution, microclimate, noise, aesthetic and wildlife quality. As well, diversity produces a healthier system and reduces risks from diseases.

b. Noise abatement

Functions. Green infrastructure can mitigate noise impact depending on the width of corridors and their design. A basic requirement of noise reduction is locating sound barriers as close as possible to the source of the noise. Noise abatement from traffic will have some effect on the lee side of the noise source (for instance in development parcels) where corridors follow the road system. In addition to actual decibel reductions, the perceptual effect of vegetation that provides a visual screen from noise sources has also been used by some acoustics engineers.[14] It has been calculated, for instance, that a narrow, visually dense screen of evergreen trees can reduce perceived sound levels by up to 6 to 8 decibels.[15] Ambient sound emanating from the larger environment, however, is unlikely to be affected by such noise abatement measures.

Performance criteria. Narrow strips of dense vegetation (coniferous or deciduous trees and shrubs) have little actual impact on noise levels. To achieve a recognizable noise reduction from

traffic requires a minimum width of approximately 30 metres of fairly dense vegetation.[16] This will be of some benefit for future development along Lake Shore Blvd. and along other wide corridors. But neither wide nor narrow corridors are likely to have any significant impact on cyclists or pedestrians where pathways are located adjacent, or close to, major traffic streets which are likely to be the main source of noise.

With respect to wildlife, traffic noise (in conjunction with conventional street landscaping) can be great enough to interfere with the ability of male birds to attract a female through song, or their ability to defend territory where the corridor is used as habitat as well as for movement. Studies have shown that highway corridors can be an ecological trap for some species if the vegetated area is not at least 50 metres wide on one side,[17] a width that is impractical for most conditions in the Port Lands. Ecological traps occur when spaces that attract wildlife have other conflicting uses (such as traffic) that can threaten animal populations. Biological and recreational factors aside, however, the main beneficiaries of noise reduction along major roads would likely be the employees and customers in future development parcels, rather than the general public. Furthermore, the general public will probably be using the Port Lands during weekends when traffic volumes are relatively low.

c. Microclimate enhancement

Functions. Vegetation, particularly trees, can significantly reduce summer temperatures by shading paved surfaces. The greater the closure of a tree canopy the greater will be its "air conditioning" effect on surface temperatures. Deciduous trees also have the great advantage, in climatic regions that suffer from extremes of summer and winter temperatures, of providing shade in summer and permitting sun to penetrate to the ground in winter. Many of Toronto's residential neighbourhoods are fortunate in this regard. The transpiration of water from plants helps to control and regulate humidity and temperature. A single large tree can transpire 450 litres of water a day, representing 230,000 calories of energy a day in evaporation which is then unavailable to heat surfaces or raise air temperatures.[18]

Studies have been carried out on vegetated wind barriers and their effects on the speed of air movement and the protection afforded. This is particularly important for our Toronto winters in general and the waterfront in particular. It has been found that the optimum density for windbreaks (the amount of wind that they let through as opposed to deflect) should be about 50 to 60 percent. In other words, the leaves, branches, and trunks should cover 50 to 60 percent of the frontal area of the belt.[19] With this density, narrow shelterbelts will afford as much shelter as wider belts of the same overall penetrability.[20]

Plants can also control snow drifting. Since they reduce wind velocity, snow particles are deposited in front of, among, and leeward of a shelterbelt. The most efficient shelterbelts have a 50 percent density. In addition, the length of the drift is related to the height of the windbreak.[21] Studies have shown that shelterbelts of tall trees with dense shrubs at least 2.5 metres in height are very effective in trapping snow and drifts from 1.5 to 2.5 metres in depth, with the snow being deposited in a band 9 to 12 metres on the lee side of the outer shrubs.[22]

This is a potential factor in determining snow clearing requirements.

Performance criteria. The microclimate of the Port Lands is influenced by its location on the Lake. With the general wind direction from the south, a green web of corridors (assuming they are composed of deciduous and coniferous trees, understorey, and shrubs) can have considerable benefits in modifying summer and winter temperatures.

A priority in implementing green infrastructure in the Port Lands should be to enhance specific local microclimatic conditions, particularly for the public using the area for recreation. Street trees will cool road surfaces and provide summer shade for walkers and cyclists. Both wide and narrow corridors will have beneficial microclimatic benefits in all seasons. In addition, the local climate will be enhanced if future building heights are relatively low. Tall buildings, in addition to preventing sunlight from entering parks and open spaces, make outdoor life uncomfortable in winter by generating downdrafts of up to two or three times the average wind speed. Since urban areas tend to produce multidirectional wind patterns, a green network of frequent wide and narrow shelter belts will help mitigate these impacts.

d. Stormwater management

Functions. Currently, the Ship Channel forms the southern limit of the lands serviced by storm sewers and water supply. The flatness of the area makes it functionally and environmentally undesirable to continue current storm drainage practice as new development proceeds, particularly to the south where the lands are not serviced. Green infrastructure can provide important opportunities to improve water quality through alternative, non-structural approaches to stormwater management that also are more cost effective.

In addition, the surface treatment of stormwater is consistent with Ministry of Environment and Energy (MOEE) guidelines[23] and current City of Toronto pilot projects for disconnecting downspouts in city neighbourhoods and encouraging the infiltration of surface water into the ground.[24]

Stormwater storage ponds and surface treatment of urban runoff aim to redress the hydrological imbalances that result from urban development by storing runoff and releasing it slowly to receiving water bodies. They restore water quality by removing contaminants before they enter surface waters, and create opportunities for habitat regeneration. The functional requirements of stormwater management go beyond engineering. They provide a basis for an integrated approach that combines engineering with improved water quality and biologically productive aquatic environments as part of the green infrastructure. This approach could also encourage infiltration of water directly into the ground through vegetation cover and porous paving (where soil conditions permit). Furthermore, the use of vegetated linear drainage ways or swales can be effective for detaining and filtering stormwater runoff.

In the long term, these non-structural methods would be expected to have clear economic advantages. They may be used as an alternative to installing conventional storm sewers where these do not exist. In addition, they may be used to supplement existing storm sewers to enhance water quality control and to reduce the amounts of stormwater in the conventional treatment system.

Performance criteria. Feasibility studies will have to be undertaken to validate the concept of surface treatment of stormwater in specific locations in the Port Lands. To carry out this work certain performance criteria should be borne in mind.

Two pond systems are necessary for water quality enhancement particularly in combination with aquatic wildlife habitat creation. They include a sedimentation pond with a detention time of 24 hours (to allow contaminated sediments to settle), and shallow constructed wetlands (to provide additional cleansing and overland flow to Lake Ontario).

Permanent and temporary pond systems have different functions. Permanent ponds are those that can be maintained by a reliable water supply during dry periods, or where surface runoff can be impounded by impervious soils and evaporation can be balanced by stormwater input. Temporary ponds are those where water infiltrates the ground after a rain storm. The former have a greater potential for creating wetland habitats; the latter include low vegetated areas that become wet for relatively short periods of time and tend to result in less diverse habitats. Corridor design in the Port Lands may require vegetation that is adapted to periodic flooding.

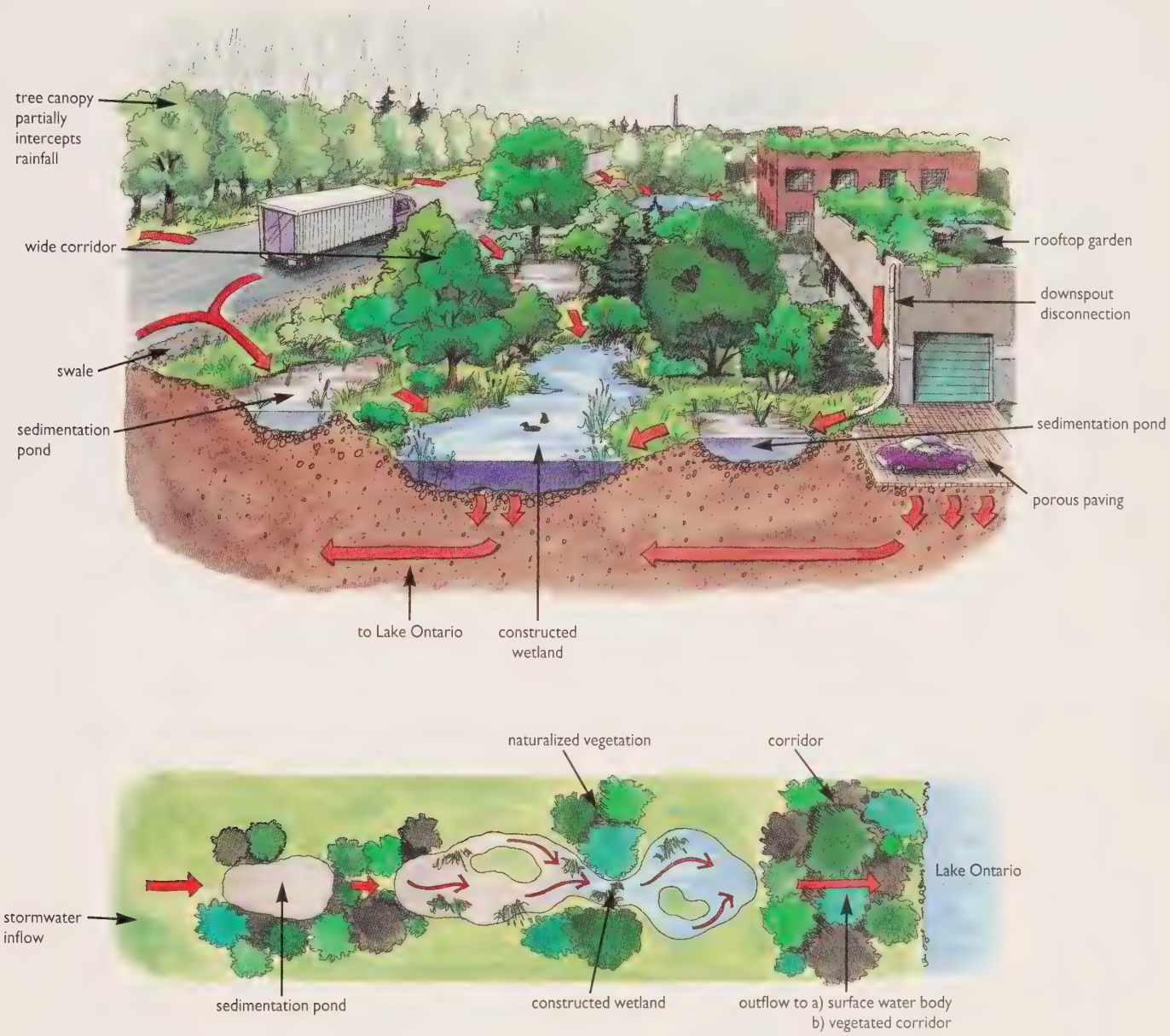
Infiltration characteristics of the fill material will require investigation at specific sites to assess both physical and chemical conditions. In situations where existing soil or ground water contamination could further degrade stormwater quality as it infiltrates the fill, it might be necessary to install subsurface ground water interceptors to direct the water to the treatment ponds. In situations where the contaminants of concern are petroleum-based (such as gasoline or fuel oil), pond design should include features to enhance natural processes of degradation, such as selected aquatic vegetation and aeration. Appropriate monitoring systems should be included in the detailed design.

Total volumes of runoff from individual development parcels can be minimized. For instance, as part of their lease agreements, tenants might be required to:

- incorporate porous paving for roads and parking lots on the property;
- maintain or plant as much vegetation as possible in outdoor areas;
- in some circumstances, store and treat runoff on individual properties, or on roofs, before it is connected back to green infrastructure elements.

The development of TEDCO's property adjacent to the Don Roadway will provide an opportunity to implement storm drainage principles in a specific location. Studies have shown that a variety of techniques can be applied, including a combination of lot level controls, such as conveying 'clean' rooftop and foundation drainage into the surrounding green infrastructure corridors, coupled with conveyance controls and end-of-pipe facilities for parking lot discharge.[25]

STORMWATER MANAGEMENT

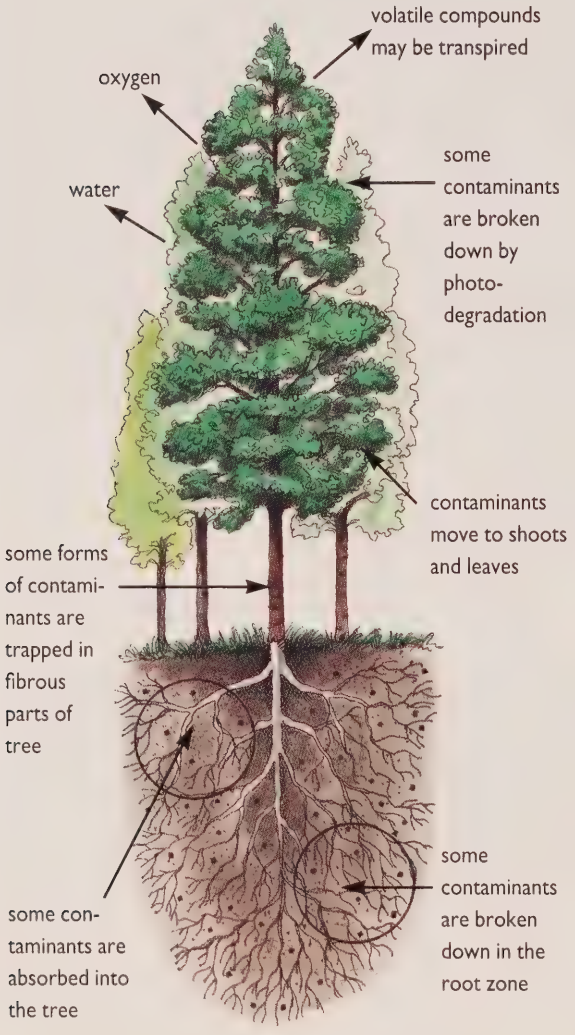


Source (lower diagram): Adapted from Hough Woodland Naylor Dance et al. 1996. Proposed Port Centre development: open space / environmental study. Toronto: Toronto Economic Development Corporation.

e. Soil and ground water management

Historic lakefilling and industrial uses in the Port Lands have resulted in impacts on soil and ground water quality in many locations.[26] Where remediation is needed, green infrastructure may be capable of improving soil and ground water quality over time using natural processes.

PHYTOREMEDIATION



Functions. There is growing evidence that "phytoremediation" (the use of certain types of vegetation to treat contaminated surface water, soil, and ground water) can be an effective and a relatively low-cost site restoration method. Phytoremediation is particularly effective as a method to degrade petroleum-based contaminants (such as fuel oil and gasoline). Other contaminants, such as heavy metals, can be removed from the substrate using selected vegetation species.[27] In this situation, plants can accumulate significant levels of heavy metals, and it may be necessary to harvest the plant material to avoid further uptake in the food chain. The Port Lands provides an important opportunity to evaluate the field application of these new methods.

Performance criteria. Where phytoremediation is technically feasible given the physical conditions and contaminants of concern at a particular location, detailed design of the green infrastructure should address issues related to public access to the area, on-going monitoring requirements, and reporting.

3.2 Restore Natural Habitats

Functions. In general, wildlife depends on habitats of different types and sizes (such as patches of woodland, meadow, or marshes), and connecting corridors (such as strips of woodland or hedgerows) to move through from one habitat to another. In urban areas, these corridors are usually streams and rivers and wooded valley slopes. Riparian corridors (vegetated land along water courses) and those associated with natural landscape features are the most valuable to wildlife, since a high number of native plants are usually found there. They are also the only relatively natural habitats remaining in densely urbanized environments.[28]

The Port Lands form a strategic wildlife link between the Don River system and Tommy Thompson Park. As an urban wilderness peninsula projecting into Lake Ontario, the Park has become internationally recognized for the diversity of flora and fauna that has established there since land filling was first begun by the Toronto Harbour Commissioners (THC) in 1959. By 1992, some 400 species of plants had been identified in seven major communities, including two nationally rare, one provincially rare, and four regionally rare plants. The total number of bird species had grown to 290, of which 40 were breeding at the site.[29]

Due to its location and form on the Lake, Tommy Thompson Park also has major significance as a stopover corridor between Lake Ontario, the Oak Ridges Moraine and rural areas north, for migrating birds in the spring and fall seasons. The Park fulfills migration and habitat functions similar to natural peninsulas such as Rondeau Provincial Park and Point Pelée National Park on Lake Erie.

Although wildlife currently moves through the Port Lands in its present state, a web of corridors and parks would greatly enrich this function. The concept of the web is particularly significant in this regard since it offers alternative routes and habitat types that a single corridor cannot.

This green web is composed of several elements, whose functions and performance criteria are described on the following pages.

a. Major parks

Four major parks provide the key elements in the web, connected by the corridors: the 480 Lands, the North Shore Parklands, Tommy Thompson Park (including the Baselands), and Ashbridge's Bay Park.

The 480 Lands would link the West Don Lands and the Don River Valley to the green infrastructure in the Port Lands.

The Baselands and the North Shore Parklands together provide essential links and stop-over points for migratory birds that connect directly to Tommy Thompson Park. A significant portion of the Baselands area was evaluated as an Environmentally Sensitive Area (ESA) in 1994.[30] In April 1996 Toronto City Council redesignated and rezoned the north end of the Baselands from "industrial" to "Natural Area and General Recreation (GR)" lands.[31]

In addition, a waterfront connection to Ashbridge's Bay Park should, in the future, link Ashbridge's Bay Park to the system.

Performance criteria. Since the presence of plant and animal species that inhabit forest interiors is an important indicator of biodiversity, the size, shape and distance between patches of habitat are of considerable significance. In general, wildlife biologists have found that the larger the habitat area the more diverse the wildlife. For instance, once a woodland reaches an area of 4 hectares it begins to attract birds that frequent forest edges. Ten hectare woodlands with interiors that are greater than 100 metres from the edge, will begin to support species that inhabit both the interior as well as the edge. At 30 hectares the habitat may contain a small area of true forest interior for birds, and can support an increasingly diverse flora and fauna. Habitat areas that are square or round have a greater potential for diversity than long thin ones.[32] Areas within 500 metres of an adjacent habitat patch will support a greater diversity of species than an isolated area the same size.[33]

The major parks recommended for the Port Lands begin to meet these requirements. The North Shore Parklands encompass 35 hectares; the Baselands encompass approximately 24 hectares; and Ashbridge's Bay Park is about 45 hectares in size. The 480 Lands would be about 22 hectares. Ashbridge's Bay Park, while heavily treed, in some areas is largely manicured. It could be more naturalized to include some wildlife areas while maintaining its traditional recreational values and uses. All of the major parks in the Port Lands are between 150 and 200 metres across and are currently directly connected to the corridor system within the Port Lands, to the Don River, and to Tommy Thompson Park.

b. Corridors

Wide corridors that offer the greatest potential for wildlife can be associated with existing streets. They include the Don Roadway, Leslie St., Lake Shore Blvd., and Commissioners St. Narrow corridors are also likely to be used as wildlife movement corridors. Some animals that are adapted to urban conditions, such as foxes, raccoons, skunks and many bird species will undoubtedly use these links, despite their narrower width and simpler vegetation structure.

The most important purposes of narrow corridors are recreational, screening, and visual amenity. The determinants for the design and size of these corridors are discussed further in the sections of this report that address Recreational Opportunities and Urban Design (see pages 31-36).

Performance criteria. Corridors in urban areas are recognized as being universally beneficial because

Corridors may be created through the use of public right-of-ways and the edges of development parcels.

they provide habitat and travelways for common wildlife species.[34] Wildlife requirements for corridors vary considerably, ranging from a few metres in width to several hundred metres, but it is generally agreed by wildlife biologists that the wider the corridor, the more effective it will be, and the greater the opportunities for establishing a diversity of habitat types (linear marshes, woodland, and meadow). Some researchers have suggested, however, that an unlinked matrix of habitats has some advantages. For instance, the absence of travelways between nodes prevents the movement of predators that prey on specialist species.[35] A minimum width of 50 metres has been found to facilitate movement for the generalist species.[36] In addition, this corridor width avoids interference by vehicular noise with the ability of male birds to attract females through song, or their ability to defend their territory (see section on Noise Abatement, pages 19-20).

A 50 metre width may be realistic along certain stretches of Lake Shore Blvd., the Don Roadway, and Leslie St. (see section on Urban Design, pages 33-36). This dimension could incorporate pedestrian and cycle movement along the edge, while maintaining the ecological functions of the corridor.

While a wide corridor width of 50 metres is considered necessary for wildlife movement, there will undoubtedly be a number of conditions where this width may not be feasible, at least in the short term, or in particular locations. The realities of existing development and interim planning decisions may require alternative approaches to corridor design to optimize the functions that can be performed. For instance, gaps in corridors may reduce continuity, but will still function at some level where a network of corridors and park nodes has been established.[37] Hedgerows composed of a narrow strip of grasses and herbaceous plants that may or may not contain trees and shrubs, will act as corridors for small mammals and provide a level of habitat for common bird species.[38] Wider corridors or shelterbelts that are at least eight rows wide, or about 15 metres, have been found to have a diversity of species, assuming the absence of mowing or cultivation.[39]

It is inevitable that vehicular access to development parcels will interrupt the continuity of wildlife corridors in some locations. In addition, road intersections may create impediments to movement but at less frequent intervals. It will be necessary, therefore, to minimize these potential conflicts in ways that allow both requirements to be met. Mitigating measures could include:

- planning entry points for trucks and cars through the narrow corridors (instead of the wide ones) to minimize impact on wildlife habitat;
- providing culvert-type bridging over drainage swales to allow unimpeded movement of small animals;
- minimizing widths of entry points within the limits of functional necessity;
- imposing speed limits on traveled routes to help reduce animal kills;
- installing warning signs to alert drivers to the need for care.

CASE STUDY:
The Husky Injection Molding Plant
Bolton, Ontario

Many industrial landscapes are composed of manicured lawns with a few trees and shrubs, performing limited environmental functions. In contrast, the five-year landscape development and management plan for the 15 hectare corporate headquarters of Husky Injection Molding Systems in Bolton demonstrates private sector leadership in promoting a more harmonious relationship between industrial development and the environment. The Husky project incorporates manufacturing facilities into pockets of newly planted forests, meadows, and woodlots.

The following objectives guide landscape development at Husky:

- Environmental concerns are primary. Plantings, once established, do not depend on chemical pesticides, fertilizers, and irrigation systems. New vegetation is diverse to allow for natural succession and the re-introduction of wildlife.
- Landscape maintenance and the associated costs are minimized over time.
- Garden areas provide important stimuli for creativity and productivity in the work place. There are diverse outdoor areas for employees to eat, walk, and exercise outdoors.

In addition, ecological principles inform the landscape design:

- Soils are preserved and protected during construction.
- Soils are improved to suit the requirements for specific vegetation types through cultivation, and the addition of non-toxic, organic and renewable products such as leaf composts, manure, and bone meal.
- Storm and surface water runoff is contained on site and filtered by emergent vegetation and aerated by weirs and waterfalls. Water is returned to water courses and ground water via open stream channels.
- Monoculture lawns are replaced with multi-layered woody and herbaceous plant societies.
- No herbicides or pesticides are used.
- Irrigation installations are used only to stabilize new plantings.

Several landscape zones have been established throughout the site, including:

- **Hedgerows/Woodlots** that offer a one kilometre nature trail for employee exercise and recreation;
- **Building Entrances and Patios** that offer inviting landscapes for visitors and employees, while providing shade and privacy;
- **Pond, Wetland and Watercourses** to provide stormwater containment and filtering functions, recharge ground water, and provide landscape diversity.

The vegetation on the campus forms a critical aspect of the landscape design, providing complexity, aesthetic quality, and social character as it evolves. The vegetation is composed of a series of layers, from the upper forest canopy down through the sub-canopy and understorey, to the groundcovers, herbaceous material and meadow grasses. All the fill used for landforming was generated on site from the construction of buildings and parking lots. A forest will be planted along site boundaries to buffer the campus from traffic and noise, and small parking lots are partitioned by 15 metre wide hedgerows. Evergreens planted near the stormwater pond serve as windbreaks and partially hide a hydro substation and cooling towers from view.

Rainwater from roofs and parking lots on the site is directed to a pond that incorporates a waterfall to aerate and control the outfall, which is then discharged to a nearby watercourse. Its careful design has made it a focal point in the landscape of the campus.

The creative design of the site's landscape and Husky's commitment to environmental concerns have made it a model for other industrial landscapes. Husky's commitment to the environment has been recognized by world-renowned environmentalist Jane Goodall, and the company has received a Governor General's award for its overall approach to business.

The project team for this work includes PMA Landscape Architects Ltd., Greenery Unlimited (Landscape Contractor), John Buttner of Bautech Developments Limited and Jurgen Rust Architects Inc. (Architects), V. A. Piscione & Associates (Engineers) and Internorth Construction Company Limited (Engineers and General Contractors).

RECREATIONAL LINKAGES

Recreational uses increase the need to improve access and provide linkages.

3.3 Enhance Recreational Opportunities

Functions. The corridor and park network provides excellent opportunities for a variety of recreational activities:

- major parks have the potential for active and/or passive recreation and environmental education;
- minor parks have the potential for active and/or passive recreation;
- wide corridors have the potential for both paved trails and walking paths on the edge of naturalized areas;
- narrow corridors ending in small parks, with seating and shade, provide for passive uses including resting and viewing;
- water's edge promenades can function as alternative bikeways, pedestrian routes, and sites for picnicking and viewing the waterfront and the city.

Performance criteria. There are several options for accommodating the different requirements of cyclists, pedestrians and in-line skaters. There should also be a recognition of changing recreation needs as the Port Lands become economically more active, and the popularity of this part of the waterfront increases.

Separated paths should be provided for slow moving activities (walking, jogging, and people with special needs) and for cyclists and in-line skaters.[40] For walking, a minimum pathway width of 1.5 metres is suggested. For cycling and in-line skating, this pathway width should be extended to a minimum of 3 metres (4.5 metres preferred). Fast moving activities can be associated with, but separated from, traffic routes. Where one-way cycling lanes are located on both sides of a bi-directional roadway, a minimum width of 1.5 metres is suggested (1.8 metres preferred). A cycling lane next to a parking lane requires a total width of parking and cycling lanes of 4 metres minimum (4.3 metres preferred) between the roadway edge and the edge of the adjacent travel lane.

The potential to use some of the abandoned railway sidings in the Port Lands to provide alternative routes for pedestrians is an opportunity which should be further explored.

An alternative approach for trail design is a single wide path that accommodates all fast and slow movement (walking, cycling, etc.), possibly 5 - 6 metres wide.[41] This option assumes that different users obey a 'keep right' code. However, due to its width and consequent undesirable impact on the landscape, such a trail may detract from the experiential possibilities of the place or from wildlife movement or habitat.

In cases where pedestrian and cycling routes follow wildlife corridors (Don Roadway, Leslie St., Lake Shore Blvd.), they should be placed at the edge of the corridor in order to maintain its ecological integrity.

Other (mainly north/south) streets and water's edge promenades associated with the harbour and Ship Channel are more urban in character. These spaces are approximately 15 metres wide, and can accommodate pedestrians and cyclists, street landscaping, passive activities and, in some cases, stormwater treatment.

Safety improvements for vehicular traffic are necessary to ensure safe access for cyclists, in-line skaters, and pedestrians. Currently, truck traffic within and beyond the Port Lands creates hazards and conflicts. Among the most important of these

is the intersection of Lake Shore Blvd. and Cherry St. where cyclists have to dismount to cross the two phase signalized light at Lake Shore Blvd.

The planning process for access routes from Riverdale must ensure that special attention is given to the improvement of signalized crossings, and creation/integration of on-road bicycle lanes where possible. Where intersection improvements occur it is preferable that the crossings be four-way crosswalks. The use of Logan Ave. as an access route would require the creation of a new signalized crossing. Other traffic intersections, road crossings (e.g. Cherry St. south of Commissioners St.) and entry points to development parcels (see Restore Natural Habitats, pages 21-22) also warrant consideration for safety improvements.

Where truck traffic is likely to be a major function within the Port Lands, pedestrian and bicycle access routes must be carefully planned to ensure safety. When cycle and pedestrian routes follow primary truck routes, efforts should be made where possible to provide separated facilities outside the road allowance. Existing linkages among the trail systems of the Lower Don River, the Waterfront Trail, and the Port Lands should be strengthened. These are currently disrupted at the Lake Shore Blvd., Cherry St., and Don Roadway intersections.

Lastly, there is growing recognition of the opportunity to design and manage urban open spaces to improve personal safety.[42] Some factors that should be considered in the green infrastructure for the Port Lands include:

- involvement of users in design;
- clear sightlines and visibility;
- good circulation, access and layout;
- access to assistance;
- orientation signage;
- diverse activities and landscapes to encourage a range of users;
- informal and/or formal surveillance;
- lighting in high-use areas;
- ongoing maintenance.

3.4 Enhance Urban Design: Sense of Place

Functions. A major purpose of the green infrastructure is to provide aesthetic order and visual quality to the public landscape, enhance property values, celebrate the Port Lands' industrial heritage, establish linkages and improve public access. The task of urban design will be to integrate these functions so that the area's special sense of place – the physical qualities and ambiance that make it different from other districts of the city – can be reinforced.

Performance criteria. To meet the requirements of the above functions attention must be given to the following:

a. Landscape character. The present flat topographic character of the Port Lands was the result of the transformation of the Ashbridge's Bay marshes into an industrial port that began with the Toronto Harbour Commissioners' 1912 plan. The area retains, therefore, a strong connection with the Lake environment. While individual parcels may be raised to ensure appropriate drainage, this overall character should be recognized and maintained in the design of the green infrastructure.

b. Major parks. The existing major Port Lands parks (North Shore Parklands, Tommy Thompson Park and the Baselands) have evolved naturally into environments of considerable ecological complexity and visual character. As part of the green infrastructure they provide varied experiences. Shaded woodlands, shrubs and old open field landscapes provide a strong natural contrast with the lake and the industrial forms of the port environment. While additional planting can, over time, enhance the recreational, educational, and aesthetic qualities of the parks, their overall character as natural environments should be respected and maintained.

c. Minor parks. At present, the minor parks have an industrial character. They are urban places with a strong functional character associated with dockwalls, shipping, and the industrial heritage of the Port. In many places they provide unparalleled views of the city across the Inner Harbour and excellent opportunities for viewing water-related port operations. It will be important to maintain this urban character in the development of these parks, by avoiding standardized "grass and tree" solutions in their design.

d. Wide corridors. A variety of informal landscapes are required to reflect the overall naturalized qualities of the Port Lands, and to provide a unique experience on this part of the waterfront. Wetland, meadow and woodland associations along wide corridors will play a large part in reinforcing these qualities by enhancing aesthetic quality and visual unity, providing a measure of screening of industrial activities and helping to dramatize the industrial waterfront character of the Port Lands.

In determining an appropriate width for these corridors (see section on Corridors, pages 26-27), design criteria will include: a relatively high density of native plant materials; a variety of planting textures, plant layers and species; deciduous and coniferous trees; and seasonal colours. These visual and screening functions may require minimum widths of between 15 to 30 metres, depending on ratios of open to closed landscape. Integrating other functions such as habitat requirements, microclimate, stormwater management, and air quality enhancement may increase these widths to about 50 metres.

*e. **Narrow corridors.*** The urban design functions of narrow corridors include the development of a more formal streetscape, and the provision of landscape buffers between streets and development parcels. They should also serve microclimatic and air quality enhancement, possible stormwater treatment and recreational functions. Design criteria include double rows of trees planted on both sides with a mix of street trees, shrubs, and natural groundcovers to maximize species diversity. Widths of 10 to 15 metres are suggested to accommodate planting, bicycle paths, and pedestrians on one side of the street, with a 3 metre boulevard for street tree planting on the other.

In addition, the informal urban character of the corridor system will be enhanced by streetscape details, such as road shoulders and edges that avoid conventional curb and gutter design, gentle sloping swales, narrow (1.5 metre) sidewalks, etc.

*f. **Development parcel landscapes.***
Development in individual parcels is expected to contribute to the overall environmental and aesthetic quality of the Port Lands. Establishing landscape guidelines for individual parcels should therefore be considered. They might include:

- incorporating stormwater ponds to reduce stormwater volume draining to the green infrastructure;
- incorporating porous paving materials to maximize infiltration of runoff from paved surfaces;
- protecting existing vegetation, and planting native trees, shrubs and groundcovers to mitigate heat build-up from paved surfaces, improve air quality and enhance aesthetics;
- incorporating low planting on roofs where this can be accommodated without significantly affecting the structural requirements of buildings.[43]

*g. **Plant types.*** Selection of plant materials in the detailed design of the green infrastructure should reflect the specific climatic, water oriented, and landscape character of the Port Lands. Planting appropriate species is, therefore, of great importance. Some examples of plant species that should be considered are listed below. These species are known to occur in the Port Lands.

*h. **Views.*** The presence of Lake Ontario, the dramatic and frequent vistas of the Inner Harbour and its boats, and the city beyond are major contributors to the area's special identity as a waterfront environment. These views need to be protected at significant places along the road network. The siting of small parks and viewing areas in these locations will contribute to the enjoyment of the special qualities of Toronto's waterfront.


Red Oak

Table 2. Appropriate species for Toronto's Port Lands

Street tree planting:	Silver Maple; Red Oak; Red Maple; Green Ash; Black Ash; Hackberry; Bur Oak.
Salt tolerant shrubs:	Tatarian Honeysuckle; Staghorn Sumac; Serviceberry; Sandbar Willow, Peachleaf Willow.
Corridor trees:	Manitoba Maple; Alder; Paper Birch; Native Choke Cherry; Red Maple; Bur Oak; Mountain Ash.
Coniferous trees:	White Spruce; White Pine; Red Pine
Naturalized shrubs:	Red Osier Dogwood; Elderberry; Spiraea; Shrub Willow.
Meadow species:	Yarrow; Black-Eyed Susan; Asters; Milkweed; Grasses.
Marsh species:	Cattail; Arrowhead; Sedges; Bulrush.


White Pine

*i. **Industrial heritage.*** The protection and interpretation of industrial heritage features is a central determinant of the sense of place in the Port Lands. It is where Toronto's waterfront history is most obvious. As long as there are large ships plying the Great Lakes and anchoring in the harbour, the working functions of the waterfront will continue to intrigue people and attract them to it. Industrial heritage should be integrated into the public landscape in various ways. For example by:

- integrating industrial features into road intersections as markers and focal points;
- adapting existing unused rail spurs to bikeway or pedestrian uses;
- incorporating interpretive signage into trail systems;
- marking and dating different stages of the waterfront's historic encroachment on the Lake;
- publishing a guide book and maps of the area and its surroundings that identify important heritage features, their history and significance to Toronto's changing waterfront landscape over time.


Serviceberry


Staghorn Sumac


Choke Cherry

*j. **Existing and potential rights-of-way.*** The Don Roadway, Leslie St., Villiers St., Cherry St., Lake Shore Blvd. and Commissioners St. are all wide thoroughfares that provide opportunities for incorporating green corridors into their rights-of-way. There is also considerable potential to increase corridor widths in some places beyond existing rights-of-way by using adjacent lands. For instance, the Leslie St. corridor could be widened using the public land on its east side. The Don Roadway, Lake Shore Blvd. and Commissioners St. corridors could, over time, be widened to include setbacks along the frontage of some development parcels.

Performance criteria should, however, recognize the short-term limitations imposed by existing buildings and land uses, the long-term functional requirements of development parcels, and what may be considered to be practically possible.

For example, Commissioners St. has hydro towers located along its central boulevard and a number of buildings flank the street on either side. Since it is the principle street of the Port Lands, the corridor width that can be accommodated for the foreseeable future is likely to be 20 metres on either side of the street. Alternatively, a 10 metre median may be accommodated in the hydro corridor with 20 metres on one side only.

Additionally, Lake Shore Blvd. may have long-term potential for accommodating a 50 metre corridor width and this should be considered the optimum if conditions were to exist. However, the industrial and commercial development potential of the lands between Lake Shore Blvd. and Commissioners St. may be compromised by a 50 metre width along the south side of Lake Shore Blvd. Consequently, at least a 20 metre corridor can be considered a more realistic alternative for the foreseeable future.

Both Leslie St. and the Don Roadway have potential for 50 metre natural corridors.

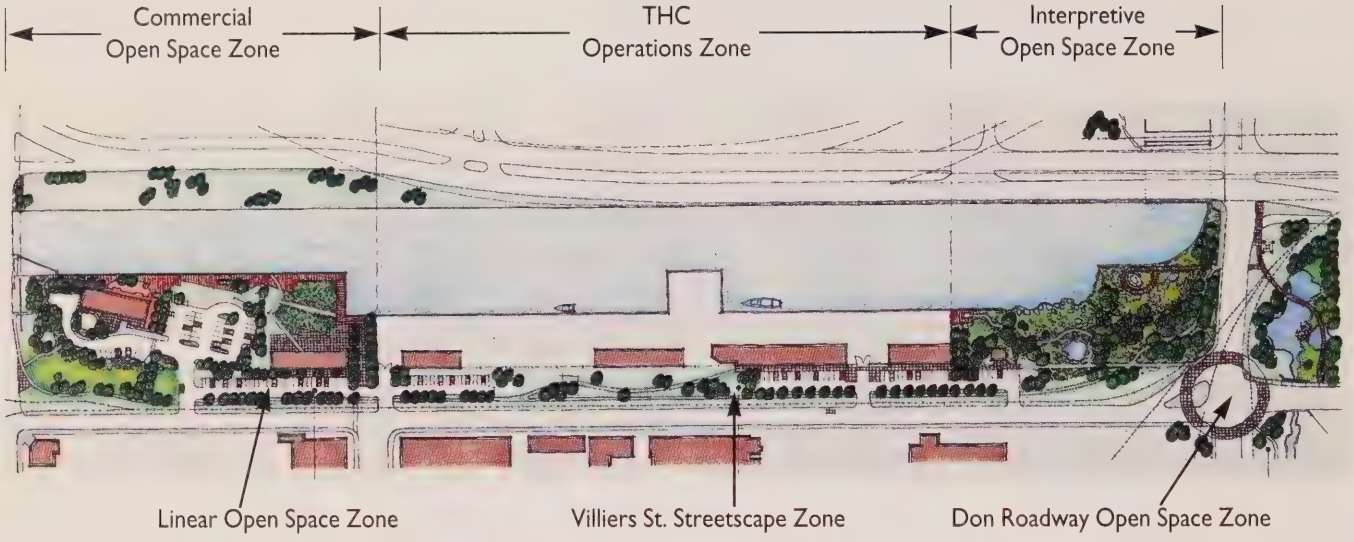
*k. **Development uses of public corridor lands.*** In addition to the functions examined in this report, the green infrastructure could provide other land use benefits to private developments:

- improvements to visual quality and sense of place, resulting from the green infrastructure, will greatly improve the marketability of the area and attract a greater diversity and number of economic activities;
- corridor zones may be designed to provide pleasant places for lunch time breaks, picnicking, or casual recreation for industrial workers.

CASE STUDY:
Petro-Canada Lubricants Refinery
Clarkson, Ontario

Work undertaken by Petro-Canada at their Lubricants Refinery located on the Mississauga waterfront, at Clarkson, is an excellent example of how green infrastructure can be implemented. When Petro-Canada upgraded the plant in 1975, they also initiated some significant changes in their approach to landscape management.

A greening plan was developed for the company by the firm Hough Woodland Naylor Dance. It provided for the planting of a 50 metre wide wooded strip linking a wildlife area to the adjacent shoreline wetland, the creation of various deciduous and coniferous habitats including the reintroduction of some locally extinct plant species, and the creation of additional aquatic habitat. For security reasons the site is fenced, but a large hill was built in a neighbouring park in order to allow viewing by the public. This area now provides a unique place for people to watch wildlife, in addition to providing a variety of habitats for a diversity of plant and animal species. Two decades of growth demonstrates how green infrastructure can assist in the integration of industrial sites into the surrounding landscape and community in a manner beneficial for all.



Source: Toronto Economic Development Corporation / Fleischer Ridout Partnership. 1997.

CASE STUDY:
Keating Channel Park
Toronto, Ontario

Located at the mouth of the Don River, Keating Channel Park provides access to the water's edge, enhances restoration efforts, and allows for the interpretation of the ecology of the Don River. Developing in several stages, the plan envisions reducing the area of the Toronto Harbour Commissioners' Works Yard, redeveloping the Canada Molasses Building for the Irish Rover's Pub, and reducing Villiers St. to provide additional landscaped area and a bike path link. Indigenous planting materials and naturalization techniques will be employed at the eastern end of the site. The Keating Channel Park is one of several new waterfront green space areas planned for the Port Lands by TEDCO.

4.0 IMPLEMENTATION

In order for the green infrastructure to be implemented as part of redevelopment projects in the Port Lands, it will be necessary to establish the overarching principles and the regional framework as described in this report, and to provide guidance to proponents regarding performance standards, monitoring and maintenance. It also will be beneficial to set out the roles and responsibilities of different stakeholders so that appropriate consultation is carried out during the planning stages of particular projects, and so that timely decisions can be made. To initiate discussion Table 3 shows how the roles can be clarified.

4.1 The public policy context

On a regional scale, the green infrastructure described in this report is supported by Metro's Official Plan and its Waterfront Plan.

In addition, the Official Plan policies of the City of Toronto support the principles of the green infrastructure outlined in this report. The existing Zoning By-law also permits the recommendations in the report to be implemented. The recent initiative by the City and TEDCO to prepare terms of reference for a development concept which addresses planning, urban design, economic and environmental issues for all of the lands south of the Ship Channel provides an important opportunity to optimize the potential of the green infrastructure for that area.

As more detailed plans are developed related to streetscape and design of specific development blocks, City staff may need to review the By-law to add specific provisions related to setbacks or other zoning matters. The performance criteria for the green infrastructure should inform these decisions.

If progress with early projects demonstrates a need to formally recognize the green infrastructure in terms of a policy statement or revisions to the maps attached to the Official Plan, this should be carried out as part of the next municipal review of official plan policies.

4.2 Integration with current initiatives

There are several initiatives that present opportunities to integrate land-use planning and transportation planning with the green infrastructure described in this report. First, the Community Impact and Environmental Management Plan, to be prepared by the Metropolitan Transportation Department as one of the next steps in the *F.G. Gardiner Expressway East Environmental Assessment and Preliminary Design Study*, should consider the green infrastructure performance criteria set out in this report as well as Metro's *Streetscape Guidelines*.[44] Second, transportation issues associated with new development in the West Don Lands and the Port Lands should address green infrastructure as a basic organizing framework for development. Third, functional links will need to be made at specific locations, particularly between corridors and development parcels, which integrate transportation needs with issues of stormwater management and contaminated soil and ground water management.

TEDCO's initiative in undertaking a corridor design study on the Don Roadway is the first major opportunity to implement part of the corridor system in the Port Lands. In partnership with the Task Force to Bring Back the Don, TEDCO has taken the lead in examining the links that can be made between the detailed design of development parcel elements such as

stormwater management, and corridor widths, and the functional opportunities that exist in adjacent green infrastructure.

Lastly, the creation of a Bicycle Transportation Plan for the City of Toronto provides an excellent opportunity to promote cycle and pedestrian issues in the context of this green infrastructure system.[45]

4.3 Corridor ownership and maintenance

Currently, the City of Toronto and TEDCO are the main landowners in the Port Lands, holding about 70% of the land area. All of the existing and proposed major parks are in public ownership. In some locations other public agencies or private businesses may own the land.

Coordinated management of the corridors and parks will be important over the longer term to optimize functions, and to ensure cost-effective maintenance and monitoring. There may be value in contracting this management and maintenance task to a single agency such as MTRCA, which has expertise in habitat restoration and management, as well as knowledge of flood protection.

Table 3. Roles and Responsibilities for Implementing Green Infrastructure

AGENCY	ROLE
The City of Toronto	Make changes to Official Plan and Zoning By-law as needed, prepare detailed design and development framework for publicly held lands in consultation with TEDCO and MTRCA, review and monitor implementation of specific projects under site plan review process, improve existing recreational trail facilities and create new opportunities for linkages.
TEDCO	Prepare detailed design and development framework for its lands, consult with City, MTRCA, MOEE, conduct public involvement program, implement field work.
MTRCA	Provide advice on floodplain management, environmental planning issues and habitat restoration.
Private landowners	Prepare detailed design for own lands, consult with City, TEDCO and other stakeholders and conduct public involvement program, implement field work.
Community groups (e.g., Task Force to Bring Back the Don, Don Watershed Council, Friends of the Spit)	Provide advice and assist with monitoring program (e.g., priorities, performance criteria at specific locations), comment on design questions, encourage public involvement, assist with planting and maintenance activities, assist in the development of educational materials and events.

4.4 Public involvement

There is a high level of knowledge and experience among individuals, agencies and environmental groups that have an interest in environmental and economic renewal in the Port Lands. Several are already actively engaged in restoration projects, including the Task Force to Bring Back the Don, the Don Watershed Regeneration Council, the City of Toronto, TEDCO, MTRCA and the Toronto Bay Initiative. Proponents of specific projects will benefit from early consultation with those who are actively engaged in restoration projects.

Detailed design and implementation of the green infrastructure offers opportunities to engage the business and residential community in productive dialogue that can have benefits in terms of the design and maintenance of the green infrastructure, as well as improving awareness and providing important research and education opportunities.

It will be important to ensure that experience gained in the early stages of implementation is applied to future stages. Collection and dissemination of monitoring information concerning the green infrastructure is essential. In April 1997 the Don Watershed Regeneration Council published the *Don Watershed Report Card*. It provides an excellent model for partners to consider in developing a report on progress in the Port Lands.

5.0 ACTIONS

5.1 Short term actions

a. The City of Toronto, in cooperation with TEDCO and other landowners in the Port Lands, should encourage implementation of the green infrastructure as redevelopment proceeds by ensuring that the City's policies and By-laws support the principles, multi-functional hierarchy and the area-wide green infrastructure framework described in this report.

It will be important to identify the lands that should be set aside as green infrastructure, recognizing the realities of current planning and site conditions and the potential for its implementation in both short and long-term time frames.

b. TEDCO should update its Master Plan and marketing strategy to integrate development proposals with green infrastructure for the Port Lands. TEDCO should provide information about the area-wide green infrastructure plan, and about progress in implementation, to existing and prospective tenants.

c. The 480 Lands should become a high priority site for rehabilitation and reuse. The City of Toronto, in conjunction with the Waterfront Regeneration Trust, MTRCA and the Task Force to Bring Back the Don, should undertake a review of the opportunities to use green infrastructure to rehabilitate these lands as a core area providing public access, recreational opportunities, and potential wildlife habitat.

d. A stormwater drainage study should be undertaken by the City of Toronto, in cooperation with TEDCO, MTRCA and MOEE, to evaluate the environmental, technical and economic implications of a surface detention pond system in the Port Lands as a whole, while taking into account existing storm sewers. The integration of stormwater treatment, soil and ground water restoration, wildlife habitat, trails, and urban design criteria should be included in such a study.

e. MTRCA, in consultation with the Canadian Wildlife Service (CWS), World Wildlife Fund (WWF), the City of Toronto and TEDCO should prepare terms of reference for a study to document the movement of birds and other wildlife in the Port Lands between the Tommy Thompson Park and the Don River Valley.

This work should establish guidelines for future development on the fringe of core habitat areas within Tommy Thompson Park (including the Baselands) and the North Shore Parklands. These guidelines should establish for landowners, developers and the City the necessary considerations and criteria needed to maintain the features and functions of existing core habitats which are in close proximity to proposed developments.

f. The area-wide green infrastructure framework described in this report should form the basis of future planning initiatives in the Port Lands, including the West Don Lands and the current initiative to prepare a development concept for the area south of the Ship Channel.

g. The trail linkages proposed in this report are options that should be considered as possible recreational trail alignments in the Port Lands. The City of Toronto, in consultation with local community groups, TEDCO and the Waterfront Regeneration Trust, should establish a north-south recreational trail to improve the links between South Riverdale and trails in the Port Lands.

5.2 Longer term actions

a. The new City of Toronto should establish a wide green corridor from the Baselands to Ashbridge's Bay Park. This should be examined in relation to future expansion plans for the Main Treatment Plant, and the options for promoting public green space and trail access south of the plant at the water's edge.

b. Pending the outcome of the work described in 5.1 e., additional enhancements of the corridor system should be considered in order to link the Don Roadway Corridor to the North Shore Parklands.

6.0 A FINAL COMMENT

The preceding pages have examined different aspects of the green infrastructure with the aim of demonstrating the concept through precedents, and providing a rational foundation for the character and design elements of the system. While economic development in the Port Lands is a priority for the City, these lands are more than simply real estate. They serve essential public functions. People walk and cycle, explore the shoreline and the piers, and are drawn to the extraordinary scale and power of this waterfront landscape.

The purpose of the green infrastructure is to integrate public functions with private interests and provide a framework that will not only improve aesthetic appearance, but give environmental, social and functional relevance to economic development. It recognizes that these economic, environmental and social relationships can, and should, be realized incrementally over time, while maintaining a larger vision for this waterfront. The opportunity for creating a safe, economically vibrant, ecologically healthy, and welcoming place is unparalleled.

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